

What is claimed is:

1 1. A semiconductor device, comprising:
2 memory cells each having an area of about $6F^2$;
3 sense amplifiers;
4 bit lines coupled to the sense amplifiers in a folded bit line configuration, each bit
5 line including a first level portion and a second level portion; and
6 active area lines, transistors being formed in the active area lines and electrically
7 coupling corresponding memory cells to corresponding first level bit lines.

1 2. The semiconductor device of claim 1, wherein each pair of bit lines is vertically
2 twisted at one or more predetermined locations, the bit lines in the pair transitioning between the
3 first level portion and the second level portion at each twist.

1 3. The semiconductor device of claim 2, wherein a column pitch of each memory
2 cell is $2F$.

1 4. The semiconductor device of claim 1, wherein each memory cell includes a
2 capacitor formed over the first level portion of each bit line.

1 5. The semiconductor device of claim 4, wherein the second level portion of each bit
2 line is formed over each capacitor.

1 6. The semiconductor device of claim 1, wherein the bit lines extend generally along
2 the same direction as the active area lines, the bit lines intersecting the active area lines at slanted
3 portions,
4 the semiconductor device further comprising contacts between the bit lines and
5 active area lines formed in the slanted portions.

1 7. The semiconductor device of claim 6, wherein the active area lines are generally
2 straight and the bit lines extend in a wavy pattern.

1 8. The semiconductor device of claim 6, wherein the bit lines are generally straight
2 and the active area lines extend in a wavy pattern.

1 9. The semiconductor device of claim 6, each bit line having a first portion on a first
2 side of a corresponding active area line, a second portion on a second side of the corresponding
3 active area line, and a third portion on the first side of the active area line.

1 10. The semiconductor device of claim 6, wherein the bit lines extend along generally
2 the same direction as the active area lines so that the bit lines and active area lines intersect at
3 predetermined locations.

1 11. A memory device comprising:
2 memory cells each having an area of about $6F^2$;
3 sense amplifiers;
4 bit lines coupled to the sense amplifiers in a folded bit line arrangement;
5 active area lines; and
6 transistors formed in the active area lines and electrically coupling corresponding
7 memory cells to corresponding bit lines.

1 12. The memory device of claim 11, wherein each bit line has a first level portion and
2 a second level portion, each transistor electrically coupling a corresponding memory cell to a
3 first level portion of a corresponding bit line.

1 13. The memory device of claim 12, wherein each pair of bit lines is vertically
2 twisted at one or more predetermined locations, the bit lines in the pair transitioning between the
3 first level portion and the second level portion at each twist.

1 14. The memory device of claim 12, wherein each memory cell includes a capacitor
2 formed over the first level portion of each bit line.

1 15. The memory device of claim 14, wherein the second level portion of each bit line
2 is formed over each capacitor.

1 16. The memory device of claim 11, wherein the bit lines extend generally along the
2 same direction as the active area lines, the bit lines intersecting the active area lines at slanted
3 portions.

1 17. The memory device of claim 11, wherein each pair of bit lines is coupled to one
2 side of a corresponding sense amplifier.

1 18. A method of making a memory device, comprising:
2 forming memory cells each having an area of about $6F^2$;
3 forming sense amplifiers;
4 coupling bit lines to the sense amplifiers in a folded bit line arrangement;
5 forming transistors in active area lines; and
6 the transistors electrically coupling corresponding memory cells to corresponding
7 bit lines.

1 19. The method of claim 18, further comprising:
2 forming each bit line of a first level portion and a second level portion; and
3 coupling each transistor to the first level portion of the corresponding bit line.

1 20. The method of claim 19, further comprising:
2 vertically twisting each pair of bit lines at one or more predetermined locations;
3 and
4 transitioning the bit lines in the pair between the first level portion and the second
5 level portion at each twist.

1 21. The method of claim 20, further comprising forming a capacitor of each memory
2 cell over the first level portion of each bit line.

- 1 22. The method of claim 21, further comprising forming the second level portion of
2 each bit line over the capacitor.